GRACE

Construction Products Division

773297

CHEMISTRY OF

VERMICULITE AND ASBESTOS

JULIE C. YANG
9/16/83

ANALYTICAL TECHNIQUES

773298

- LIGHT/OPTICAL MICROSCOPY — 10 - 430 X
  - Dark Field Illumination
  - Dispersion Staining
  - Petrographic Method

- SCANNING ELECTRON MICROSCOPY (SEM) — 100 - 40,000 X
  - Energy Dispersive X-Ray Spectroscopy (EDXS)

- TRANSMISSION ELECTRON MICROSCOPY (TEM) — 500 - 40,000 X
  - Selective Area Electron Diffraction (SAED)

- X-RAY DIFFRACTION (XRD)
  - Detection >0.2% of Mineral Species

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COMPUTATION FOR 8 HOUR EXPOSURE

8 Hour Time Weighted Average Values:

$$C_{TW} = \frac{\Sigma\ C_1 \cdot t_1}{\Sigma t_1} = \frac{C_1 t_1 + C_2 t_2 + \ldots\ldots C_n t_n}{t_1 + t_2 + \ldots\ldots t_n}$$

Where C_{TW} = time weighted average concentration (fibers/ml)

C_1 = single value of concentration (fibers/ml)

t_1 = single sample duration (min.)

Σt_1 = total sample duration

n = total number of samples

Equivalent 8 Hour Exposure:

$$f = \frac{\text{full shift time or job time (hours)}}{\text{8 hours}}$$

$$C\ eq = f.C_{TW}$$

Where f = factor

Ceq = equivalent 8 hour exposure concentration

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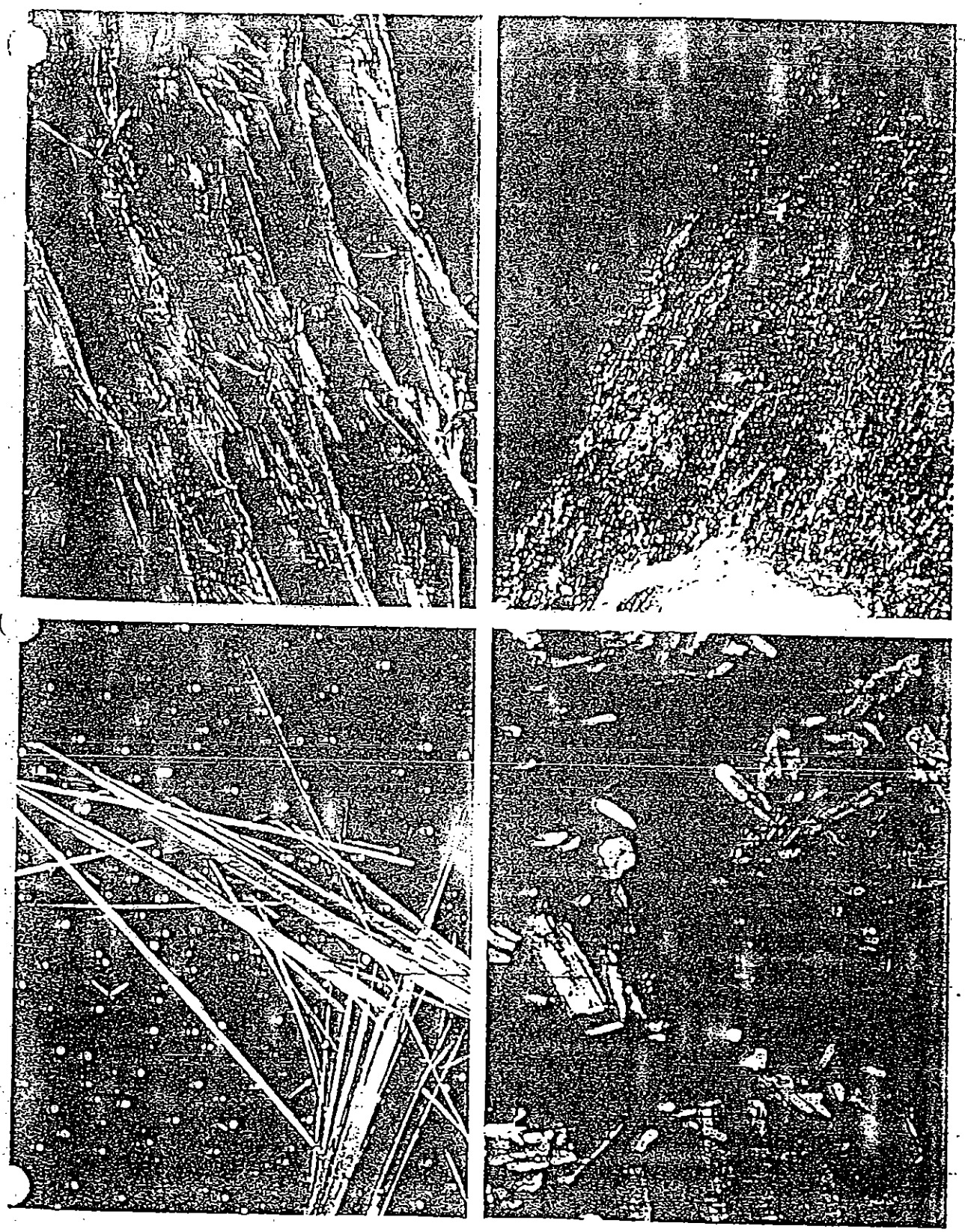

Megascopic and microscopic photographs of asbestos and nonasbestos tremolite: Upper panels - megascopic, left—tremolite asbestos and right—nonasbestos tremolite; lower panels—microscopic, left—tremolite asbestos and right—nonasbestos tremolite.

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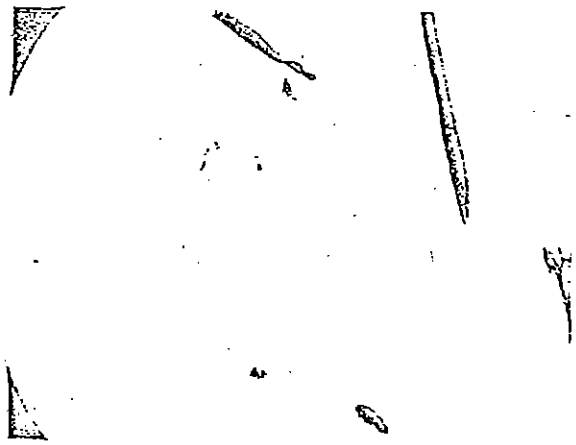

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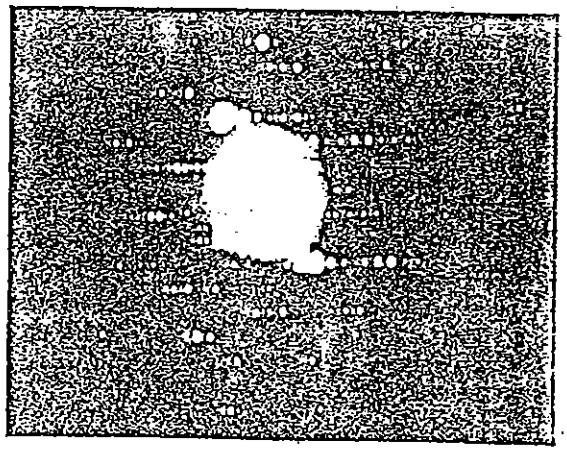

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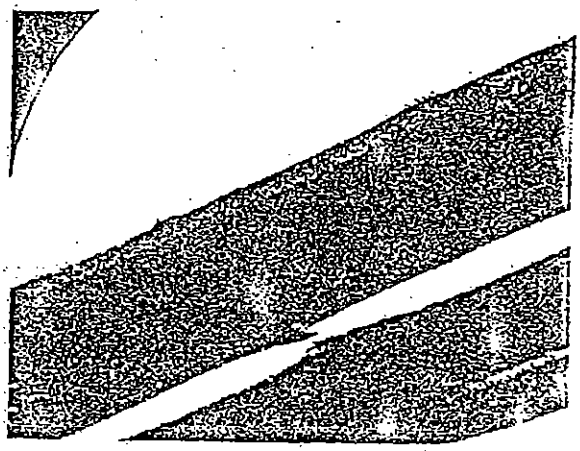

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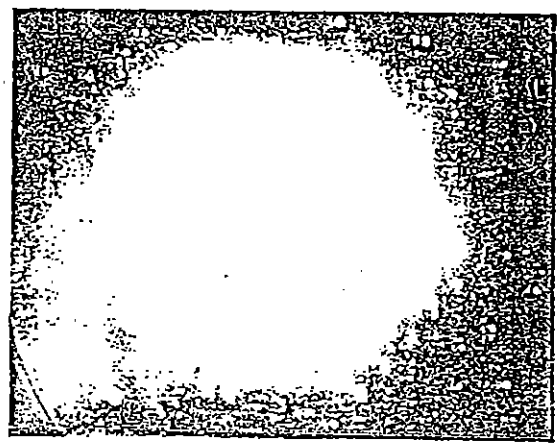

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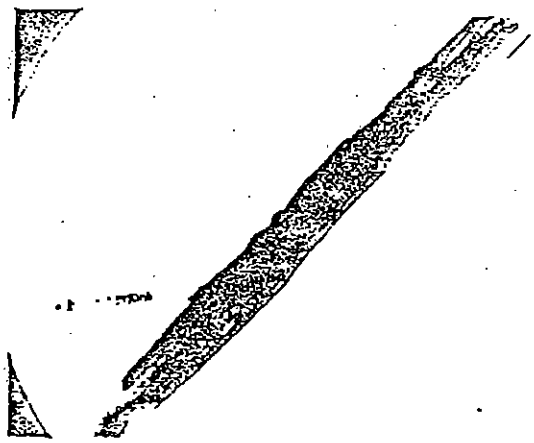

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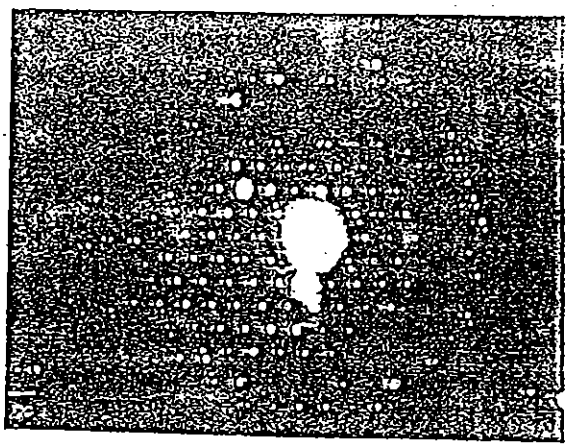

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TREMOLITE

1 µm

20,000X

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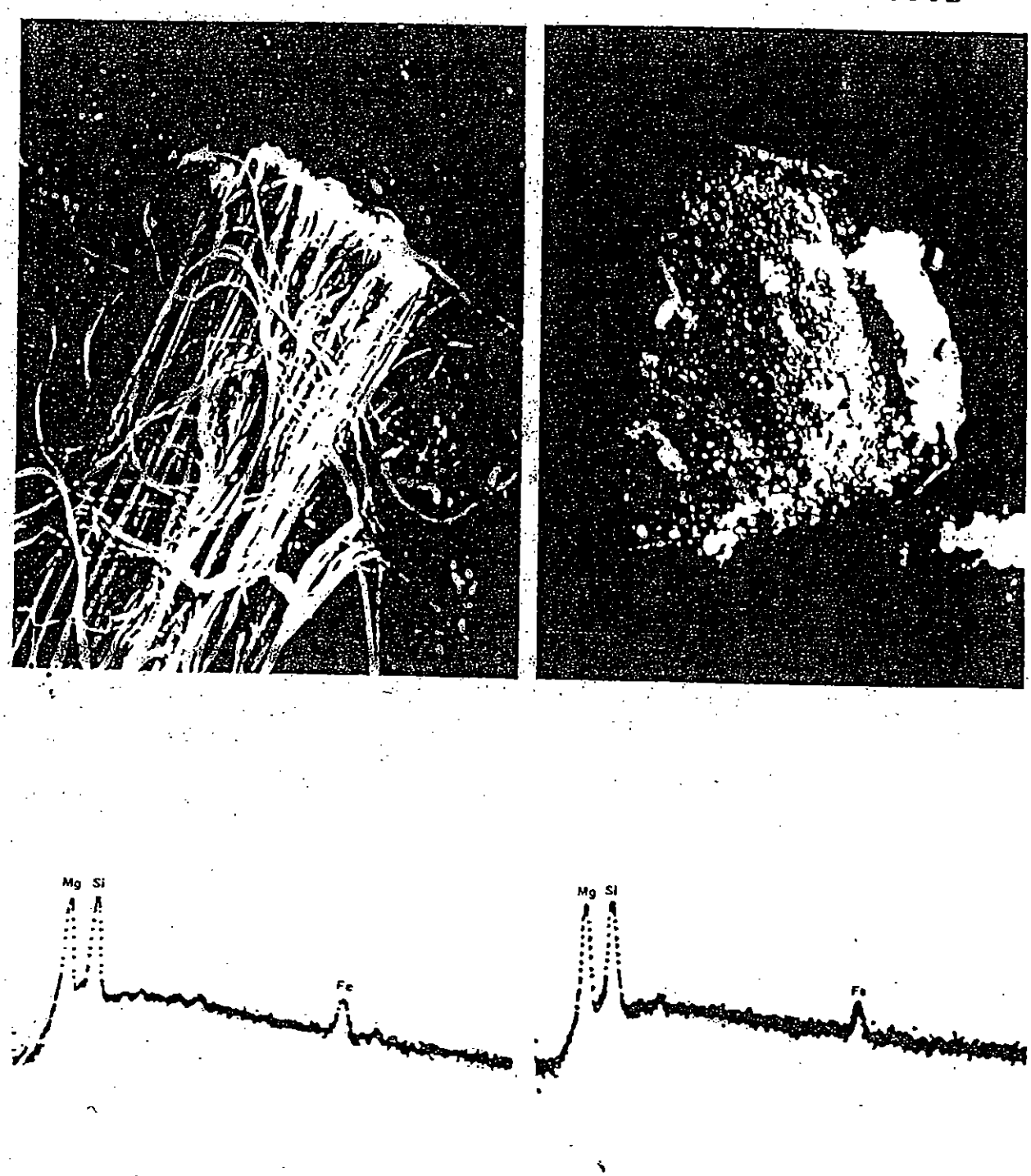

- Scanning electron microscope (SEM) and energy dispersion X-ray spectra (EDX) photographs of chrysotile asbestos and nonasbestos antigorite-lizardite: Upper panels - SEM, left—chrysotile and right—antigorite-lizardite; lower panels - EDX, left chrysotile and right—antigorite-lizardite.

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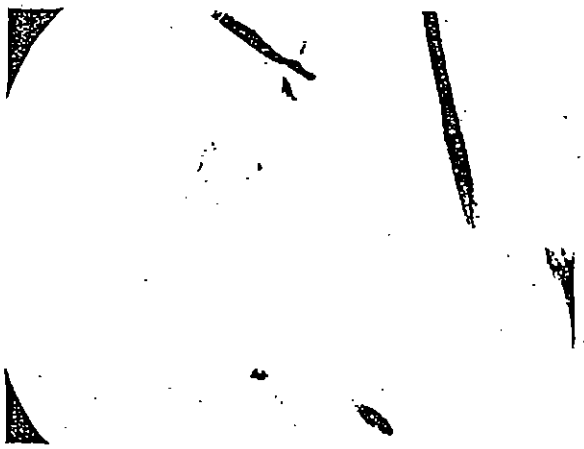

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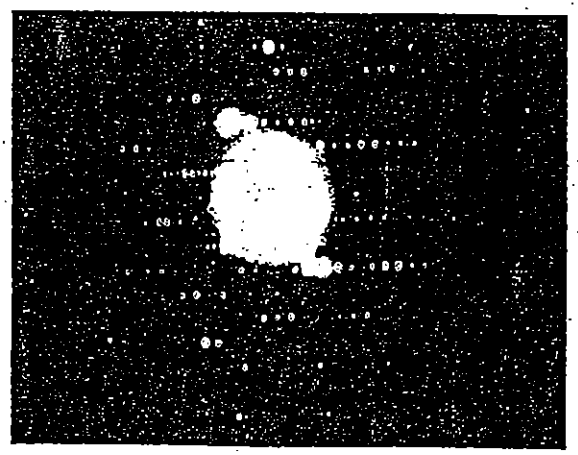

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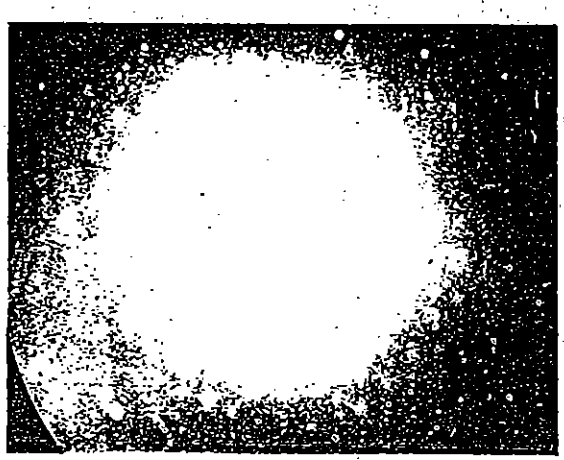

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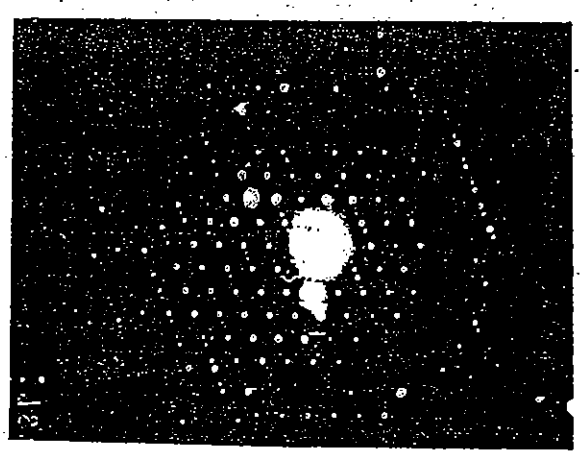

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TREMOLITE

1 µm

20,000X

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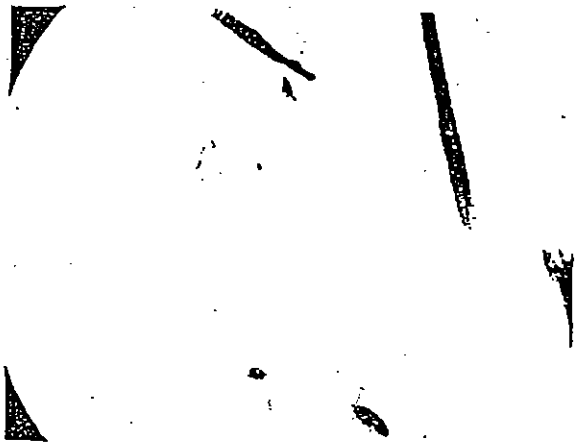

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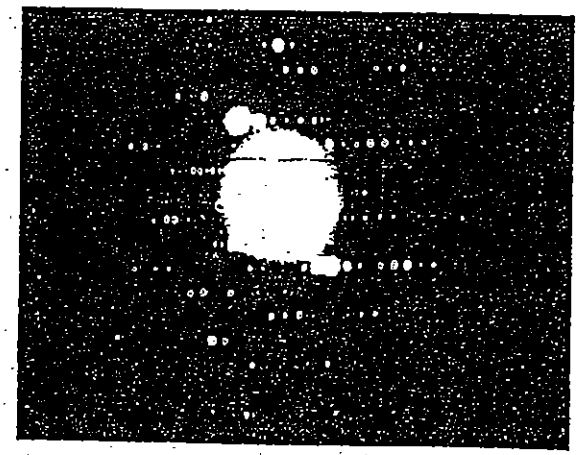

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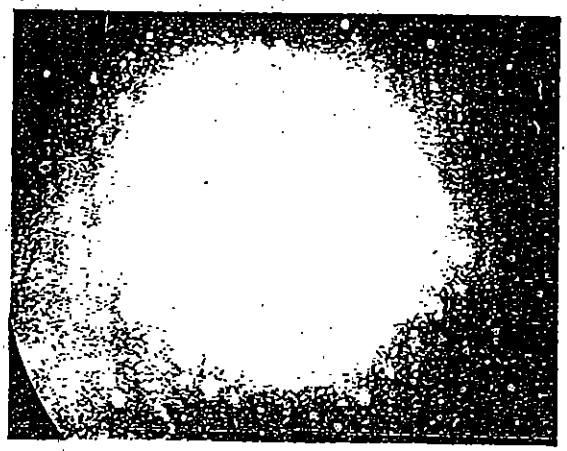

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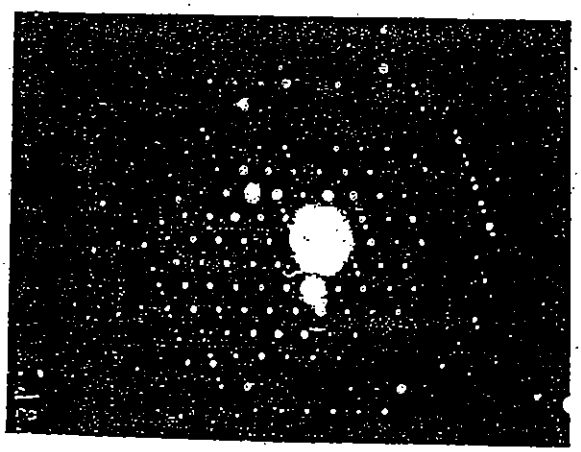

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TREMOLITE

1 µm

20,000X

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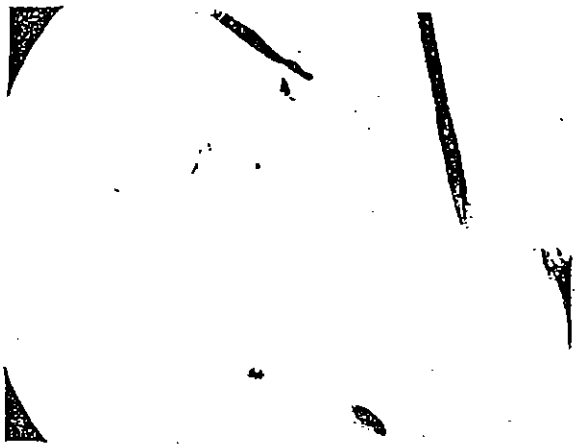

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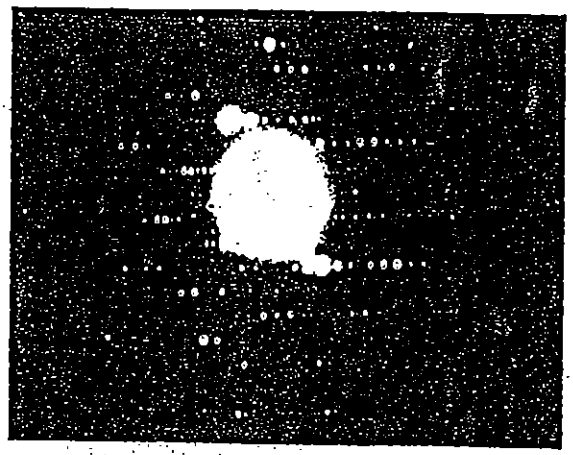

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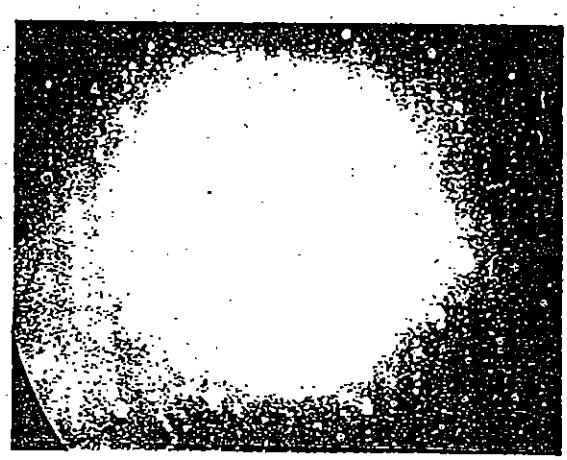

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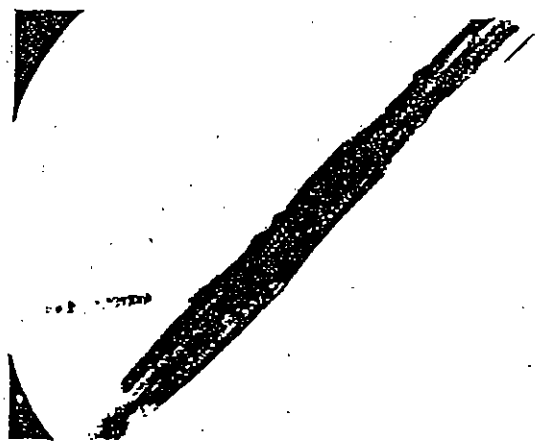

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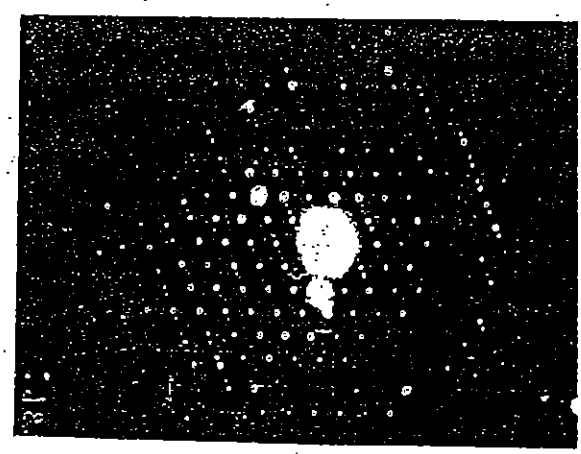

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TREMOLITE

1 μm

20,000X

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Figure 1

SOME ASBESTOS MINERALS AND FORMULAS

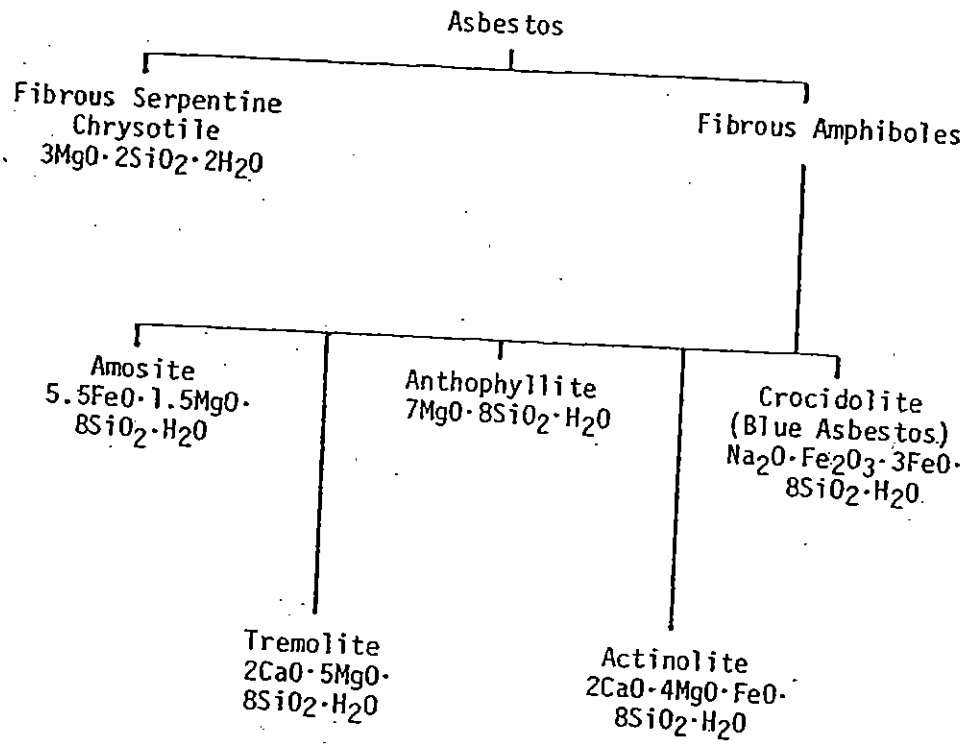

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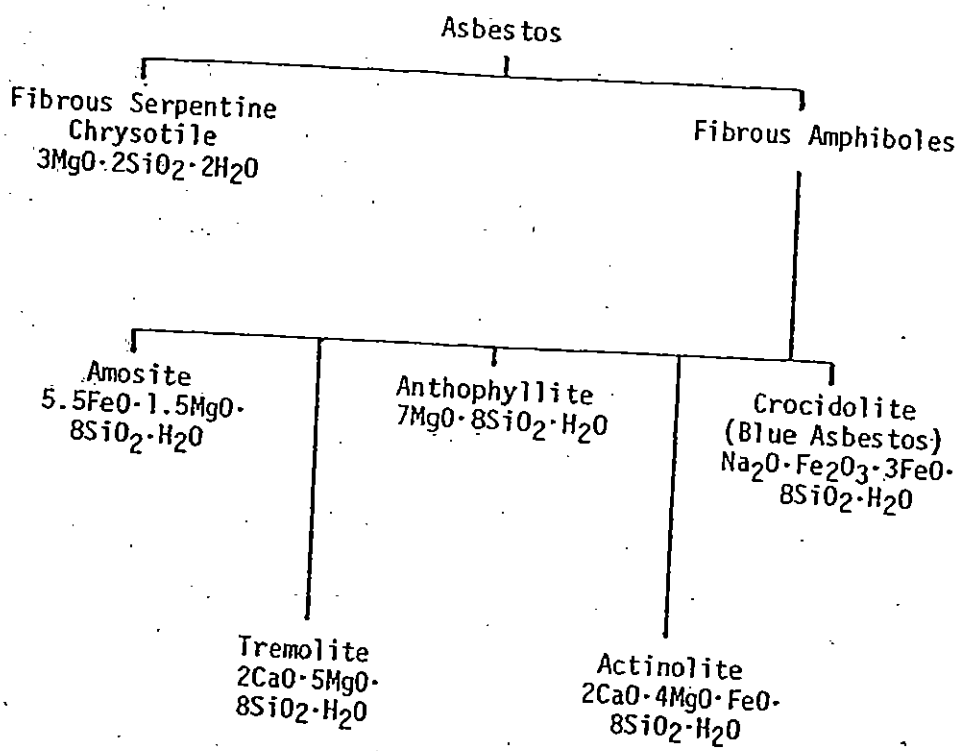
Figure 1

SOME ASBESTOS MINERALS AND FORMULAS



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PROCEDURE FOR FIBER COUNTING

I. Preparation Of The Slides

- Cut a pie shaped segment from the cellulose filter sample with a dissecting knife.
- Place a drop of mounting solution* in the center of a slide.
- Draw the mounting solution into a triangular shape using a clean glass rod.
- Remove the pie segment from the cassette using curved forceps and place it on the mounting solution.
- Place the cover glass over the sample, and let set for approximately 10 minutes.
- Apply very slight pressure to the cover slip to remove trapped air bubbles and clear slide.
- The slide is cleared up after 1-2 hours (overnight is better) and ready for reading.

* Mounting solution is a mixture of equal volume portion of dimethyl oxalate and dimethyl phthalate, with 1/30 of its volume of the filters added and thoroughly mixed.

JCY/pad
5/12/83

773309

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5/12/83

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II. Counting

A Porton reticle in the eye piece is used for defining field of counting. The Porton reticle is calibrated against a slide micrometer. Our counting field area is 0.0027mm^2.

A daily check of the phase ring is made to assure the microscope is operating in good condition.

We follow the NIOSH method for evaluating airborne asbestos fibers and count 100 fields or 100 fibers whatever is reached first. Types of fiber to be counted are:

- Fiber length is 5 microns in length or longer.
- Fibers whose length to diameter ratio (aspect ratio) is greater than 3.
- Fiber with diameter less than 3 microns.

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5/12/83